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AUTOKON AT A SMALL SHIPYARD

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The following information is not only a collection of ideas used in the original implementation of Port Weller's computerized numerical control system, but also contains some of my own opinions of how and why a computerized mould loft is an essential part of a productive and progressive shipyard. Some of these ideas, naturally, would have to be altered to suit each particular shipyard, but the basic philosophy of simplicity which Port Weller used should be applied in all shipyards. I hope to explain why this is so important not only for us - the small shipyard - but also why it is essential to the medium to large yards as well.

There are two general subjects that will be covered in this paper - justification and implementation. The justification will be brief and figures represented in this portion are not actual figures obtained from Port Weller records, but are superficial numbers used only to give the basic ideas of how the eventual purchase of the Autokon system was justified at Port Weller Dry Docks.

The implementation portion will be an actual account of our use of numerical control programming starting from December 1973, when the part and nest programs were first obtained from Shipping Research Services.

JUSTIFICATION

Justifying a computerized N/C system is actually accomplished by a very simple formula. The first thing that must be determined is in what areas money can be saved by using N/C tapes and how much money it will take to implement and maintain such a venture.

The most obvious way that money can be saved by using N/C programs is in steel preparation, fabrication and erection. A small shipyard would, for instance, produce approximately 10,000 tons of steel per year. If you used a figure of 50 manhours per ton, that gives you a total of 500,000 man hours per year, and using a $10.00 hourly rate, that comes to 5 million dollars per year in steel *man* hours. In other words, it takes only one per cent reduction of man hours in this area to produce $50,000.00 in savings. Now all that must be done is to come up with a realistic budget to find out what per cent must be saved to justify changing to the new system.

The following is a breakdown of the minimum requirements for installing a computerized N/C system:

N/C Burning Machine

Automatic Drafting Machine

Computer Terminal

Key Punch Machine

Office Space and Furniturc.

System Supervisor

Equipment Operator

Computer Programs

Training

The following ideas will be based on the supposition that a shipyard is to put the use of an N/C system through a trial period of one year.

The N/C burning machine will probably be the most difficult to justify because it would have to be purchased and it represents the largest capital investment. (This is assuming the N/C programs will be leased).

The cost of buying and installing a burning machine is in the neighbourhood of $150,000.00 which includes the cost of a director at about $30,000.00. These costs are based on the idea of buying only the basic 4 torch, 40 bed. I do not believe that it would be wise at this point to get involved in rotating heads for beveling and a 3 axis machine is, in my opinion, an unwise investment and should not be considered for shipbuilding applications.

This cost, however, should not be considered an investment entirely committed to this venture. The only portion that would be lost if the N/C System failed would be the cost of the director, as the burning machine could certainly be utilized in burning rectangular plates or converted to optical burning if you use that particular lofting procedure.

The acquisition of a drafting machine and computer terminal can be done by leasing with an option to buy. This type of arrangement was available in 1973, and I assume that this is still possible at this time. The configuration of this equipment will be discussed in more detail in the implementation portion of this paper.

There are two computer systems available that are suitable for shipyard applications. They are commonly known as the "Autokon" system and the "Spades" system.

A license for the use of Autokon in the United States can be obtained from the Maritime Administration, Washington, D.C. Related, system support and program training is available from the REAPS Program staff, and production services can be acquired from Shipping Research Services, Alexandria, Viginia.

The Spades system can be obtained from Cali and Associates, Metaoroe, Louisana. They offer, as well, program training and production services.

The other items listed should be self-explanatory and wlll not be discussed any further at this point.

The cost of installing a computerized numerical control system should come to a total cost of about $400,000.00 for a one year trial period. As discussed earlier, $120,000,00 of the cost for the burning machine should be excluded for the purpose of calculating the percentage of savings needed to justify this system. This leaves us with an expenditure of only $280,000,00 - or a reduction of 5 to 6 per cent in steel man hours to justify this project,

Based on the achievements at Port Weller Dry Docks, a six per cent reduction in steel man hours can be considered only a moderate degree of success. After a similar trial period described above, the management of Port Weller approved the purchase of all the Autokon programs and the automatic drafting machine. We have also added a second numerical control burning machine and built new office facilities for the part coders.

After the signing of a contract to build an Arctic *Class* bulk carrier, the acquisition of Alkon part programming and Prelikon (design programs related to the Autokon system) were approved by management. The training for these programs has been completed and no serious problems have been encountered. The approval of purchase for these programs can only be attributed to the financial success of computerized numerical control *at* Port Weller.

IMPLEMENTATION

The installation of the computer programs should be a very simple task - have this done by the people the system was obtained from. There is no need to be concerned about making the programs work for you since this has been done for a number of years by many shipyards using the same system.

It is very important that you realize that there is absolutely no reason to have a system analyst (computer programmer) at your shipyard for implementing or using the programs. A shipyard will have all the assistance needed from the supplier.

The system supervisor should be someone with experience in the N/C programming field - preferably in the system you intend to use - but not absolutely necessary. I believe that this person should be carefully chosen and he must have the necessary backing from the manager of production.

The personnel to be trained in the programs should be well qualified in three areas - blueprint reading, general shipbuilding knowledge, and layout - before he or she is trained to be a part coder.

The loftsman, of course, is the most logical tradesman for this job, but we have had success with the experienced plater

and shipwright as well. More than half the knowledge required for the part coder job is already achieved by these craftsmen. This is really a big advantage as well because the basic training of these people can be achieved in only a few weeks. This is a big advantage for the plater as well, because with the introduction of an N/C system a shipyard will not need as many platers as required with any other loft production method. This system should be an integral part of *the* full scale loft. It is very easy for the part coder to supply the ship with stiffner lengths, templates or lengths for face flats and templates for brackets related to the parts he has coded.

Ihe loft should have the following personnel:

Validator - 1 for every 4 - 6 coders

Nesters - 1 for every 8 - 10 coders

Manual Loftsman - *2* for each 8 - 20 thousand tons per year

Part Coders - 6 - 8 for each 8 - 10 thousand tons per year

These figures may have to be altered slightly depending *on* the type of vessel being built and the amount of success the coders have in using the programs.

The personnel required to operate the terminal, drafting machine and key punch should be limited to one for each 6 - 8 coders. Port Weller has used the services of a part time employee for these tasks during vacation times or times where the work load is heavy and difficult to handle by one person. This is an important job and the individual hired for this position must be dependable and competent. A log of all programmed parts and the filing of program decks can be done by this employee as well.

The office space for the terminal, drafting machine, key punch and active records should be well planned and must be environmentally controlled. This room should be entirely separate from all other functions, and traffic in this area should be kept to a minimum. An ideal location for this *room* is the existing loft since you will not need as much area for full scale lofting once the change has been made to computerized lofting.

The automatic drafting machine should not pose a big problem because there are only two companies with extensive experience in the verification of numerical tapes. They both offer shipbuilding verification software and adequate service is provided by both. A wide variety of table sizes are available from both companies, but I *can see no* reason for having a drawing surface more than 4 feet by 5 feet. The *larger* tables are much more expensive

and have no particular advantage to justify this extra cost.

The remote terminal can be a very difficult problem because of the many types available. Port Weller has had excellent service from Data 100 of Minneapolis, but each yard will have to make a choice depending on the service available locally.

Both suppliers of drafting machines offer remote terminals and this could be a very good solution, but the availability of quick service should be weighed carefully.

The installation of a computerized numerical control system involves some very important decisions, but the task can be achieved if you take the time to evaluate the experience of others. There are many times that we benefit from the mistakes as well as the success of others.